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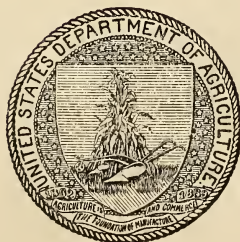
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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XVII.

THE PORTERS LOAM AND PORTERS
BLACK LOAM.

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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XVII.

THE PORTERS LOAM AND PORTERS BLACK LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Porters loam and Porters black loam are two intimately associated types of soil which occur only at the higher elevations in the eastern ranges of the Appalachian system from Virginia southward through North Carolina into the extreme western portion of South Carolina. Although of limited geographical extent, these soils possess probably the greatest range in altitude of any types occurring east of the Rocky Mountains, since they extend from the low foothills along the eastern slope of the Blue Ridge Mountains to the extreme summits of the highest Appalachian peaks, covering the slopes and even the top of Mount Mitchell, at an altitude in excess of 6,700 feet. The Porters loam has been mapped in four different soil survey areas in the States of North Carolina and South Carolina to the total extent of 436,160 acres, while the Porters black loam has been encountered in seven areas in Virginia and North Carolina, and a total area of 193,550 acres has been included in these surveys.

CHARACTERISTIC OF SOIL AND SUBSOIL.

The surface soil of the Porters loam to a depth ranging from 6 to 15 inches is a dark-brown, reddish-brown, or sometimes gray loam. The subsoil to a depth of 3 feet or more is a reddish-brown clay loam, immediately beneath the soil, but grades down into a heavier red clay at greater depths. Small fragments and masses of the parent rock are numerous in the subsoil, and are frequently found in the surface soil, although they only accumulate sufficiently to interfere with cultivation over small local areas. The Porters loam is readily distinguishable from all other soils of the eastern United States through the fact that it is the characteristic soil type of the mountain slopes of the western portions of both North Carolina and South Carolina. It lies at the higher altitudes over the foothills and flanks of the mountains and occupies even the crests of the foothills and lower ridges. It is distinguished from the mountain soils

of all other series through the fact that it is derived from the crystalline rocks, chiefly granites, gneisses, and mica schists, and through the fact of the yellowish-red or deep-red color of the subsoil. In this latter respect it resembles the soils of the Cecil series, which are confined to the lower, Piedmont region, lying at the eastern foot of the mountains. It is separable from the soils of the latter series chiefly through its more rolling and mountainous surface features and through its occurrence at considerably higher altitudes.

The surface soil of the Porters black loam is a rich, dark loam having an average depth of about 15 inches, but ranging in depth from 5 or 6 inches to a maximum of 2 or 3 feet. It is not infrequently mixed with rounded and angular fragments of rock varying in size from a few inches to several feet in diameter. The immediate subsoil is usually a brown or reddish-brown loam which grades downward into a heavy red clay at greater depths, as is the case with the Porters loam. The surface soil of the Porters black loam consists of the partly decayed organic remains of a heavy vegetative growth mingled with the broken fragments and the finer earth formed through the decay in place of the gneisses, granites, and other eruptive rocks at the higher altitudes in the eastern Appalachian ranges and particularly in the north sloping coves to be found between the ridges in this mountainous country. It is easily distinguishable from all other members of the Porters series through the deep, dark-colored surface soil, rich in organic matter, while, like the Porters loam and the other members of the same series, it is the only mountain soil possessing a dark-red subsoil.

SURFACE FEATURES AND DRAINAGE.

Both the Porters loam and the Porters black loam are distinctively mountain soils occurring at all elevations in the eastern ranges of the Appalachian Mountains from an altitude of 850 or 900 feet in the foothills to altitudes of 3,000 and 4,000 feet in the main ridges and even attaining to an altitude of 6,700 feet above tide at the top of Mount Mitchell in North Carolina. The country throughout which these two types prevail is marked by extreme ruggedness. Some of the mountain slopes are so steep as to render their cultivation unprofitable, or in many places even impossible. On the higher plateau portion marking the crests of the main ridges in western North Carolina are superimposed many cross-chains of mountains, the most notable of these being the Newfound Mountains and the Black Mountains. In the Blue Ridge section of western Virginia the altitudes rise nearly 4,000 feet above tidewater and the mountain country is characterized by a smooth broad-topped ridge which is flanked on either slope by spurs and sharp knobs which descend to the foothills,

bordering the Piedmont section to the east and the Great Valley region to the west. Thus throughout the entire extent of the territory which the soils of the Porters series dominate, and where the Porters loam and black loam have their greatest development, the topography is that of the highest ridges and most notable mountain peaks in the eastern portion of the United States.

The Porters loam and black loam are found at all altitudes within this mountainous region, rising gently over the bordering foothills, occupying the rolling floors of the intermountain valleys, and forming the dominant soils of the minor valleys and the coves which are included between the principal ranges and which are enfolded within the minor ridges and cross ridges of the mountain system.

In general the Porters loam is most extensively developed in the intermountain valleys and over the lower foothills, although it is found also upon the flanks of the lower mountains and across the crests of the smaller ridges. The Porters black loam, on the other hand, occurs almost universally at some elevation, and is prevalent upon the northern, northeastern, and northwestern slopes of the higher mountains and within the more elevated coves having the same exposure. It occupies practically all of the soil areas to be found upon the flanks and the higher peaks of Mount Mitchell.

These two soil types occupy practically all of the territory which may become subject to agricultural occupation in this general region, although not nearly all of the area, even of these two types, is topographically so situated that it may be brought under cultivation. Only other subordinate types of the Porters series with some minor local types constitute the remainder of the farm land of this mountain section, while vast areas are too stony for cultivation or consist of rocky ledges and steep slopes totally unsuited to agricultural occupation. Thus the Porters loam and the Porters black loam constitute the principal agricultural soils of the south-central portion of the more eastern Appalachian ranges.

Owing to the elevated mountainous position of the Porters loam and the Porters black loam, drainage is excellent throughout practically all portions of both types. The slopes are considerable and the heavy precipitation of the higher mountain regions gives rise to the formation of many large mountain springs and of innumerable smaller streams which coalesce to form the larger southeastern rivers which have their sources in the Appalachian system and flow, thence, both to the Atlantic Ocean and to the eastern tributaries of the Mississippi River.

The region is one of heavy to excessive rainfalls, due to its high altitude and to the interception of moisture-laden air currents by the mountain peaks and ranges. In consequence of the heavy rainfall and the steep slopes of this section, erosion is apt to be excessive

over any portion of either type of soil which, through continued cultivation, is exposed to washing. As a result many fields, particularly of the Porters loam, which have been cleared and brought under cultivation in the past have been so severely gullied and washed that further cultivation has become impossible, and a considerable proportion of the area of the type once cleared has been allowed to revert to a forested or a brushy condition. Over other considerable areas the persistence of at least some portion of the original forest has prevented the excessive erosion, but the cutting of the forest cover would undoubtedly result in the rapid bodily removal of the surface soil and of considerable portions even of the subsoil.

In consequence of rough topography, of the remote location of considerable areas of both types from transportation and from market, and of a strong tendency toward excessive erosion, only small proportions of the Porters loam and Porters black loam are now occupied for agricultural purposes.

LIMITATIONS IN USE.

The Porters loam is well suited by its texture and other physical characteristics to the production of the general farm crops adapted to the climate in which it occurs. It is not particularly well suited to any special crops, with the possible exception of Irish potatoes and cabbages. There are many restrictions upon its possible uses which are imposed, not by the character of the soil itself, but by the topography of the region which it occupies and by the limitations of transportation facilities. Frequently after a few years of cultivation the organic matter content of the surface soil of the Porters loam becomes decidedly reduced, and if at the same time this is accompanied by serious erosion, large areas of the surface soil are bodily removed and the farmer finds himself dealing with the less tractable and less productive subsoil materials.

Erosion is probably the most serious problem which is encountered in the agricultural occupation of the Porters loam or Porters black loam. Torrential rainfall occurs not only during the earlier spring months, but at all periods of the growing season. The slopes within the areas of these two types range from a 7° or 8° slope to maximum slopes of 30° and 35° . The latter are altogether too steep for cultivation and should never have been cleared. Even the lighter slopes are so great as to give rise to rapid run-off of the rain water and to the speedy removal of surface soil, unless special precautions are taken to retain it in its place. As a result, deep gashes and gullies have been cut through many cultivable fields, and entire farms and even districts have been ruined for all present agricultural purposes through the excessive erosion of the soil. A part of this damage has been needless, since ordinary precautions would have made possible

the tillage of the more gently sloping areas. A part of the damage, however, has been inevitable, particularly upon the steeper slopes, since no agricultural methods lying within the means of the individual farmers could prevent the erosion of tilled soils upon slopes in excess of 20° . Forestation is the only remedy for erosion upon these steeper slopes, and such lands should never have been cleared of their entire forest growth in the first place. Thus the areas of the Porters loam and Porters black loam, which may be tilled with any profit, are decidedly limited by the slopes and the resultant erosion effects of rapidly flowing water.

There are other tillage difficulties in connection with the cultivation of the Porters loam and black loam. In general, the individual areas capable of cultivation are of small extent, and even in the more gently sloping portions of such fields the use of power machinery is totally eliminated both by the small size of the field and by the considerable slope of the surface of the land. Throughout a considerable portion of the area where both types occur, the use of the one-horse or one-mule plow is prevalent and the majority of such plows have the movable moldboard which enables the operator to plow back and forth across the field, always turning the furrow in one direction. Similarly the majority of other tillage operations must be carried on through the use of a single animal for motive power and through the employment of the light-weight, small-sized tillage instruments. Both seeding and planting must be done largely by hand, and the grain crop must be secured through the use of hand implements. Even the thrashing of the grain becomes a matter of some difficulty, since only small-sized outfits can travel the mountain roads to thrash out the grain. There are thus topographic limitations upon the cropping of these soils which not only decrease the efficiency of both types in the production of the common crops, but also, over a considerable proportion of their extent, prevent the introduction of special crops suited to these soils and to their climatic environment.

Although the Porters loam and black loam occur only over a narrow range of latitude, the great range in altitude occupied by the types gives rise to considerable differences in the climatic surroundings. At the lower altitudes in South Carolina and in North Carolina the Porters loam is frequently planted to cotton and a fair crop is produced. At higher altitudes and in more northern sections this crop is totally eliminated and only the grains and the grasses may be grown. In the higher altitudes the production of any crops, except rye, buckwheat, potatoes, and grass, is made impossible because of climatic conditions, while at the highest altitudes, as on the flanks of Mount Mitchell, not only are farm crops eliminated, but the mountains themselves are bare of practically all tree growth.

Thus the range in altitude within the limits covered by the two types gives rise to a wide climatic variation, limiting the characteristic crops which may be grown in the different zones of this elevation. This climatic environment, due to altitude, will be discussed more fully in the consideration of fruit crops suited to production upon the Porters black loam.

IMPROVEMENT IN SOIL EFFICIENCY.

The chief improvement in the effective cultivation of both the Porters loam and the Porters black loam should consist in the adoption of methods whereby excessive erosion could be held in check. The most effective methods for the prevention of soil erosion in mountainous sections consist in the terracing of the cultivated fields, whereby narrow, almost horizontal strips are left to grow up to grass, separating the tilled areas from each other in concentric bands and permitting surface waters to flow directly down hill only for short distances until they are checked against the grass-covered terraces. The system of terracing must necessarily be combined with that of contour farming. This method consists of laying out the rows of all intertilled crops in a nearly horizontal alignment around the slopes of the hills, so that the water furrows between the rows have only a gentle gradation and no great velocity can be gained by the rain water flowing across the surface. Upon the more gentle slopes this method of combined terracing and contour farming is usually adequate to check the gullying and the more serious erosion of the field. It is also desirable in the tillage of the land to use cover crops which will occupy the soil during the winter and spring months to form a mat of surface vegetation and to assist, through the binding action of the roots, in retaining the soils in place.

Throughout the area occupied by the Porters loam and Porters black loam rye and winter wheat are possibly the best crops for this purpose. Upon the Porters black loam, owing to the large amount of organic matter present in the surface soil, some little difficulty is experienced in the production of these two crops for grain through the "heaving out" of the crops by freezing and thawing during the earlier spring months. This, however, should not interfere with the use of the crops to prevent erosion, even though the grain yield is somewhat reduced. In the case of the Porters loam it would also be particularly desirable to incorporate additional amounts of organic matter in the surface soil and gradually to increase the depth of plowing, in order that a deeper absorbing reservoir might be formed for the rain water, thus preventing the bodily slipping away of the surface soil when it is in a saturated condition and the underlying clay is thoroughly lubricated by the excess of moisture.

The adoption of these methods for the prevention of erosion would considerably increase the extent of the area capable of cultivation in the case of the Porters loam, and would somewhat extend it even in the case of the Porters black loam. In addition to these methods of the control of soil erosion there should be added a systematic rotation of crops, which will permit the soils to remain under grass cover for a considerable period during each rotation. The fact that timothy, bluegrass, and the clovers all grow to advantage upon both types of soil renders this an easy as well as an efficient method for the reduction of the ravages of soil-washing.

The restoration of organic matter to the surface soil in the case of the Porters loam has been mentioned as one of the essential steps toward the prevention of soil erosion. It is also necessary in order to form a complete, easily tilled surface soil, which will be sufficiently retentive of moisture to maintain a good growth of the grain crops, particularly of corn, during the summer season. For such purposes the growing of cowpeas, seeded between the rows of corn at the last cultivation, should be practiced at the lower altitudes where the type is found. Crimson clover would also be a valuable crop for seeding with the corn under the same conditions. At the higher altitudes the restoration of organic matter to the soil, because of climatic conditions, must be dependent upon the growing of winter cover crops such as rye and winter wheat, and upon the turning under of the sod from grass, which should be grown in regular rotation with other crops. In addition, an occasional crop of buckwheat grown solely for this purpose might be turned under upon areas where both the mineral matter and the organic matter of the surface soil have been bodily removed by erosion. In general the Porters black loam is sufficiently supplied with organic matter, so that these practices are not essential upon that type.

LIMITATIONS UPON SPECIAL CROPS.

The chief limitation upon the production of both general and special farm crops within the area occupied by the Porters loam and Porters black loam, aside from those limitations of use already mentioned, consists in the climatic variations dependent upon the wide differences in altitude occupied by these two types. Since the chief special crop produced within the area is the apple crop, and since this is largely confined to the Porters black loam, the climatic limitations which circumscribe the growing of this crop are illustrative of the effect of climate upon the agriculture of the region.

For successful fruit growing by far the best orchard location is within the "frostless belt" or "thermal zone," the altitude of which varies considerably in the different locations from Virginia.

southward to South Carolina. This "thermal zone" exists only where the orchard sites are protected from the strong winds and the heavy storms, coming chiefly from a western direction. Thus upon the eastern flanks of the Blue Ridge, in altitudes ranging from 1,200 to 1,500 feet or somewhat higher in Virginia, and at altitudes ranging from 1,400 feet to 2,000 feet above sea level in western North Carolina and western South Carolina, there exists a belt of territory within which unseasonable frosts rarely occur. It is between these elevations that the best quality of fruit is produced and the Porters black loam is the dominant orchard soil of the section. In fact, in Virginia, the adaptation of this type to the production of a certain variety of apples has caused it to be known as the "pippin land" of this section.

There is a further restriction placed upon the planting of apple orchards through the direction of exposure or the aspect of the orchard site. Thus in general it may be said that the pippins will be of the very best quality only in the sheltered coves within the "thermal belt" which have a northern or northeastern exposure, while the red varieties of apples and practically all varieties of peaches are grown to best advantage within this belt upon eastern or southeastern exposures. In all cases the slope must be such as to give adequate air and water drainage, thus preventing largely the ravages of fungous diseases which would otherwise interfere with the orcharding operations.

This climatic limitation, which is so pronounced in the case of orchard fruits, is also noticeable in the case of practically all other crops. It has already been noted that practically no agricultural crops may be grown above an altitude of 3,500 or 4,000 feet in this general section and that even the timber growth becomes stunted or lacking at the highest altitudes. It is also a fact that from 2,500 feet to 4,000 feet above tide level the *crops of northern latitudes alone* may be cultivated to advantage, and even corn is not fully successful at the upper limit of this zone. Wheat, rye, oats, buckwheat, and timothy are the crops best suited to the highest altitudes, while corn, wheat, and mixed timothy and clover are suited to the intermediate altitudes. Irish potatoes do fairly well even to the upper limits of cultivation and seem to have a wider range in altitude than any other special crop which may be grown upon these two types. Cotton, sweet potatoes, and similar crops are, of course, successful only at the lowest altitudes and in the more southern locations. Thus the existence of climatic zones due to differences in altitudes is very marked in the case of the region occupied by the Porters loam and black loam.

There is another limitation even upon the most valuable special crops which may be produced upon these two types; it is the limita-

tion of transportation facilities to market. Owing to the markedly mountainous character of the country, only the lower altitudes are served by railroad transportation, and in many instances even the highways and public roads are infrequent and of difficult grade over considerable portions of the region occupied by these types. In fact, large areas of both still remain uncleared and uncultivated, even when their altitude and topographic features are favorable to agriculture because of the impossibility of bringing the produce of the fields to market. Even within the areas tilled, the different communities are, to a large extent, thrown upon their own resources, and considerable proportions of all crops raised are produced only for home consumption within the limited community, while many of the supplies used by the farm family, which in other regions constitute the objects of commerce, are here produced in the form of domestic manufactures at the homes of the mountain farmers. Transportation, or rather its lack, thus constitutes a very important limitation upon the present utilization of the arable areas of both of these types.

EXTENT OF OCCUPATION.

Owing to the mountainous character of the country and to the consequent limitations already outlined, only a small proportion of either the Porters loam or Porters black loam has yet been occupied for agricultural purposes. It is probable that, taking the entire region under consideration, not over 15 per cent of the area of either type is agriculturally occupied. The remaining 85 per cent consists of forested areas at the lower and intermediate altitudes up to approximately 5,000 feet and of thinly wooded, stony areas above that altitude. Even within the lower areas only the more gently sloping locations and those accessible to transportation have been cleared and occupied, and the attempt to cultivate the steeper slopes has almost universally been followed by the enforced abandonment of such locations through excessive erosion. In such instances the old fields are slowly being reclothed by less valuable timber growths, particularly the Jersey scrub pine and some of the hardwoods.

It is improbable that, except for the purpose of orcharding, any large additional areas of either the Porters loam or Porters black loam will be brought under agricultural dominion at an early date. Wherever transportation is accessible, however, the properly situated coves and lower slopes, chiefly occupied by the Porters black loam, are being sought for the location of orchards. In Virginia many such coves have already been planted to the Albemarle Pippin upon the northern slopes or to the Winesap and to other red apples and to peaches upon the eastern and southern slopes. Apple orcharding has not yet gained such a predominance in the North Carolina areas where the Porters black loam is extensively developed. This

is partially due to the lack of transportation and partially due to the imperfect outlining of the climatic zone within which apple orcharding is most successful. There remain thousands of acres in western North Carolina, consisting of coves occupied by the Porters black loam, which are still available at a low price for the planting of apple orchards and of peaches. The present interest in horticultural development will undoubtedly result in the searching out of these localities within the next few years.

CROP ADAPTATIONS.

General farm crops.—The Porters loam is the characteristic general farming soil of the mountain region of western South Carolina and western North Carolina. While general farming has not been developed to any high state of prosperity, still the principal cereal crops and certain special crops are also produced to fair advantage. In the lower and intermediate altitudes corn is an almost universal crop. The yields vary greatly, dependent upon the amount of erosion which the soil has locally experienced, and upon the amount of care which has been exerted in the maintenance of organic matter in the surface soil. In the North Carolina areas, at altitudes ranging from 1,250 to 2,500 feet above sea level, corn is a fairly successful crop, producing from 12 to 30 bushels per acre. It is probable that these yields might be doubled through the proper preparation and tillage of the Porters loam, including chiefly the restoration of organic matter to the soil. The use of all stable and yard manures in this connection is highly to be recommended, and, as already pointed out, green crops should frequently be turned under in order to maintain organic matter. It is probable also that the range in altitude of corn production could be considerably increased if the flint varieties of corn were used at the higher altitudes, since they are capable of reaching maturity in a shorter growing period than that required by the dent varieties, now chiefly grown.

Winter wheat is also a crop generally raised in North Carolina upon the Porters loam. The yields are extremely varied, ranging from 8 to 20 bushels per acre with an average not in excess of 10 or 11 bushels. Oats are also produced, particularly at the higher altitudes, giving fair yields, ranging from 20 to 30 bushels per acre, and averaging about 25 bushels.

These constitute the chief cereal crops, although buckwheat is sometimes raised at the higher altitudes to a limited extent, and rye is not infrequently sown in the place of wheat.

The Porters loam is essentially an excellent grass soil at practically all altitudes where it occurs, especially upon the more sloping areas which have been allowed to seed naturally to bluegrass and redtop. An excellent pasture sod is maintained, while the artificial

seeding to mixed timothy and clover is usually successful, and fair yields of hay are secured. It is very desirable, owing to the prevalence of erosion over the type, that considerable areas of grass should be seeded upon it, and timothy, redtop, alsike, and red clover, together with bluegrass, are all available for the establishment of both mowing areas and of grazing lands. A considerable proportion of the more sloping and rugged areas of the Porters loam is now used, in connection with the arable areas, for the grazing of cattle and to a limited extent for the grazing of sheep. An extension of the occupation of the type for such purposes is not only possible but desirable. In general it may be said that the Porters loam is one of the best soils of the region for general farming purposes, and that its best crop adaptations for such purposes consist of corn, oats, and grass.

Irish potatoes and cabbages are both produced to excellent advantage upon the Porters loam, and small areas of potatoes are produced upon each farm for local use. It is only in the vicinity of transportation facilities, and particularly in the vicinity of those points which maintain a considerable summer tourist population, that potatoes and cabbages are grown upon the market-garden or commercial scale. Upon properly cared for fields the yields of Irish potatoes are excellent, ranging from 75 to 200 bushels per acre. Cabbages yield from 5 to 8 tons, and both crops are decidedly profitable where the proper market exists. At the lower altitudes in North Carolina and South Carolina sweet potatoes are also grown to some extent, principally for home consumption.

The general crops raised upon the Porters black loam are principally corn, winter wheat to a limited extent, and oats and grass. The corn yields range from 12 or 15 bushels per acre to 25 or 30 bushels. The yields of wheat are low, principally from the fact that the loose, porous texture of the surface soil permits of excessive heaving by the spring frosts, thus reducing the crop yields. Returns of 8 to 12 bushels per acre are normal. Oats are somewhat more successful, giving yields of 20 to 30 bushels per acre. The Porters black loam is as well suited to grass production as the Porters loam, giving good yields of mixed timothy and clover hay, and being capable of maintaining an excellent growth of mixed timothy, redtop, bluegrass, and the clovers for pasturage purposes.

Fruit crops.—The Porters black loam, however, is principally occupied and is justly celebrated for the production of apples. In practically every area where it occurs in the eastern Appalachian Ranges, especially within the "thermal zone" already described and in those positions having the proper air and water drainage, it is the very best apple soil which can be found. Upon no other type are apples so successful, and upon no other type can the Albemarle Pippin be grown to such perfection. It is in the sheltered coves upon the

northern slopes at not too great an elevation that the Pippin attains its very highest quality—a smooth, yellow, transparent skin, solid flesh, and that delicate flavor for which the apple is celebrated. In other locations, particularly with eastern and southern exposures where other conditions are favorable, the red and striped apples of the latitude are produced to advantage. The Winesap, Yellow Transparent, Red Limber Twig, Greensboro Late June, and the Greensboro Striped June are all raised to advantage. In addition, peach orchards have been planted and the varieties which have been the most successful are the Belyeu Comet, the Elberta, and the Crawford.

Besides apples and peaches in many localities grapes have been grown to advantage. The Norton's Virginia Seedling, the Concord, Ives, Catawba, and Delaware are all successful varieties.

Thus the Porters black loam constitutes one of the most important mountain fruit soil types from the vicinity of the Potomac River southward to western North Carolina. Undoubtedly additional areas will be planted to orchards of all descriptions as transportation facilities become more adequate and as the more remote coves, valleys, and slopes occupied by this type become known to horticulturists.

Animal husbandry.—The existence of large areas of mountain land suitable only to forestation and pasturage would seem to indicate that the Porters loam should be utilized for the production of forage crops upon the tilled areas and of grasses and pasturage upon the more sloping areas. In the States where the Porters loam occurs the production of milk, butter, and cheese is at a minimum. Virginia, and particularly North Carolina and South Carolina, import large quantities of all of these products for local use. It is one of the essential requirements for the dairy industry that an adequate supply of pure water should be available in connection with the grazing lands. It is also essential that the dairy industry should be carried on within the cooler climatic zones of these States. As a result, with the exception of certain Piedmont areas, there is probably no better region in either North or South Carolina than the lower slopes and foothills occupied by the Porters loam for the development of the dairy industry. The natural grass production of the type is excellent. Many of the slopes are capable of no other occupation than that of pasturage or forestry. The supply of pure, cold water is abundant and the climatic conditions are favorable to the dairy industry. Improved cattle and an increased knowledge of modern dairy methods are essential to the wider development of this industry; but the markets and the natural advantages all exist, and the Porters loam should become the dominant type of soil devoted to dairy products in the lower mountain regions of both North and South Carolina.

In this connection the production of both sheep and swine should be added to the animal industry of the section, particularly for the production of the meat supplies, which are now largely imported into the southern manufacturing and commercial cities.

Farm equipment.—As has been noted, the rough topography and the steep slopes of both the Porters loam and Porters black loam practically preclude the use of heavy draft animals and the more elaborate farm tools used in other sections. Upon the steeper slopes a large proportion of the tillage is done by hand, including the seeding and reaping of the grain and the planting of the corn. Even the plowing and the harrowing are done by one horse, one mule, or even a single ox, with the simplest and lightest draft farm implements. Many of the mountain farmers perform practically all of the hauling of the grain and fodder crops upon sleds, while in the more gently rolling foothill sections light wagons and the one or two horse hitch are most common. No elaborate machinery can be recommended for these regions, although upon the gentler slopes the disk plow and the disk harrow have both been used successfully in the tillage of the Porters loam. Even in the developed orchard sections a considerable proportion of the tillage is carried on with light equipment, and the spraying of the trees is a matter of some difficulty because of the steep slopes which prevent the use of power sprayers. In no section is the equipment of farm buildings equal to the average for the United States, and in many instances the barns are mere sheds or log structures, strongly reminiscent of pioneer days and indicative of the pioneer conditions which still prevail over a considerable proportion of the territory occupied by these two types. Considerable improvement is shown, however, in the vicinity of transportation facilities, and particularly near the centers occupied by the summer colonies in the mountain sections.

Forestation.—In the case of both the Porters loam and the Porters black loam, the remoteness from transportation and the topographic difficulties render large areas unsuitable for any agricultural occupation in the commonly accepted sense of the word. Since the forest is, now, to be considered as a farm crop, a considerable proportion of both types should be occupied by private or public forest reserves for the production of various timber crops. In considering the different areas where the Porters loam has been found it becomes evident that in all of the higher altitudes the deciduous forests have occupied by far the greater proportion of the type, and over a vast extent of territory forestation is the only possible form of profitable occupation for these soils.

At the lower altitudes and in the more southern locations, both the shortleaf and loblolly pine have their natural habitat upon the Porters loam, while at higher altitudes and in more northern locations

from South Carolina to Virginia, inclusive, the forest growth consists chiefly of the hardwoods, principally white oak, chestnut oak, red oak, post oak, and scarlet oak, with some black oak and shingle oak. In addition, hickory is generally present, while upon many of the steeper slopes there is a strong stand of chestnut. Within the sheltered valleys and coves, where deep, moist soil exists, the poplar and maple are prominent at the lower altitudes, while there is some white pine and a considerable amount of hemlock in the cool and moist valleys and gorges at the greatest altitudes. Throughout the general extent of the type there is also a rank undergrowth of the mountain laurel, rhododendron, azalias, and chinquapin, while beneath this minor growth is a heavy carpet of mosses and of ferns.

While a considerable proportion of both the Porters loam and Porters black loam, accessible to transportation, has already been cut over, there are still extensive tracts in the more remote regions which remain practically untouched so far as lumbering operations are concerned. Even in the more accessible sections where lumbering operations have been carried on for the longest period of time, there is usually a rapid reoccupation of the cut-over lands, principally by the hardwood growths.

There thus exists within the territory covered by the Porters loam and the Porters black loam a considerable area which through all of its characteristics of altitude, climate, and soil is peculiarly and preeminently fitted for forest occupation, and which, because of steep slope and of inaccessibility, is of little value for general agricultural purposes. In addition, practically all of the principal streams of the southeastern seaboard States have their headwaters and the headwaters of their principal tributaries in the same partially forested section. It is again apparent that forestation is extremely desirable, not only from the standpoint of the production of timber for future use, but also from the standpoint of the protection of the sources of the domestic water supply and of water power for the adjoining Piedmont and Coastal Plain sections.

In addition the majority of the slopes within the areas occupied by the Porters black loam and the Porters loam are all so steep that even if agricultural occupation were otherwise desirable, the tendency toward excessive erosion is so great that entire fields are rapidly destroyed after they are cleared and devoted to farm purposes, bringing about not only the destruction of the local soil areas but also endangering the rich bottom lands through which these streams flow and deposit their burden of sand and silt in the lower lying Piedmont section.

Thus, from every standpoint, the maintenance of extensive areas of these two soil types, in the eastern Appalachian region, in a forested condition is desirable.

SUMMARY.

The Porters loam is the most extensive soil type in the central portion of the eastern ranges and upon the eastern peaks of the Appalachian Mountains.

It occupies all of the altitudes from the lower foothills at about 1,000 feet above sea level to altitudes of 4,000 or 5,000 feet. In general the surface is rolling to mountainous and the drainage is adequate to excessive.

Among the general farm crops there is a considerable range in the different localities where the Porters loam is found, since cotton may be grown at the lower elevations in South Carolina and in North Carolina, while corn, winter wheat, oats, and grass occupy the intermediate altitudes, and potatoes, rye, buckwheat, and grass are grown even at the highest altitudes.

Irish potatoes and cabbages are the most important special crops grown upon this type.

Certain varieties of the red apples are produced to advantage within the "thermal belt" upon the Porters loam. In general, however, little attention has thus far been paid to apple orcharding upon the type.

In addition to the crop production at present dominant over the Porters loam, it is desirable that the dairy industry should be established to utilize the crops now grown, and particularly to utilize extensive areas of natural pasturage upon the steeper slopes. In this connection the grazing of sheep and swine is also desirable.

The steeper slopes are all subject to destructive erosion at times of heavy rainfall. Many such slopes should be reforested and some of them should never have been occupied for agricultural purposes.

The Porters black loam is an important soil type of less extent than the Porters loam, which is found principally in Virginia and North Carolina in the coves and upon the slopes of the Blue Ridge and upon the higher slopes of the Black Mountains, the Newfound Mountain, and the other high ridges of western North Carolina.

The surface of the type is always sloping and frequently steep to rugged or mountainous. It is only within the coves or upon the more gentle slopes that agricultural occupation has gained any foothold. The higher altitudes are principally occupied by heavy deciduous forest.

The Porters black loam is essentially a special-crop soil, being the type upon which the Albemarle Pippin reaches its highest development and gives its most profitable returns. For the proper production of the Albemarle Pippin the sheltered coves and northward slopes within the "thermal zone" are best suited. Upon eastern and southern slopes the red varieties of apples and certain varieties of peaches and grapes are also successfully produced.

General farm crops are not extensively grown upon the Porters black loam, although oats and grasses are successfully produced.

There are extensive areas of the Porters black loam suitable for apple orcharding which, because of lack of transportation or remoteness from market, have not yet been occupied. In consequence, there still remain excellent opportunities for bringing into cultivation considerable areas of the Porters black loam when transportation facilities are provided, and when the peculiar adaptation of this type to apple orcharding is understood in the more southern locations where it occurs.

These two types of soil constitute the most extensive soils of the higher mountain regions of the eastern Appalachians, and they possess the greatest range in altitude and the most rugged topography of any of the soil types occupied for agricultural purposes east of the Rocky Mountains.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *June 26, 1911.*

APPENDIX.

The following table shows the extent of the Porters loam and the Porters black loam in the areas surveyed at this time.

In the first column is stated the particular soil survey in which the soil was encountered; in the second column its extent of development in acres; and in the third column the volume of the Field Operations of the Bureau of Soils in which the report upon the area may be found. Those desiring a detailed description of the soil and of the general conditions which surround it in any particular area may consult these volumes in almost any public library.

Areas of Porters loam and Porters black loam encountered in the soil survey.

PORTERS LOAM.

Survey.	Area of soil.	Year of publica- tion, Field Opera- tions.
North Carolina:	<i>Acres.</i>	
Asheville area	180,416	1903
Henderson County	70,656	1907
Transylvania County	151,424	1906
South Carolina: Oconee County	33,664	1907

PORTERS BLACK LOAM.

North Carolina:		
Asheville area	24,064	1903
Henderson County	320	1907
Hickory area	512	1902
Mount Mitchell area	87,808	1902
Transylvania County	3,840	1906
Virginia:		
Albemarle area	68,736	1902
Bedford area	8,270	1901

